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EXAMINER	
HIGA, BRENDAN Y	
ART UNIT	**PAPER NUMBER**
2153	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/608,585	COCHRAN ET AL.	
	Examiner	Art Unit	
	BRENDAN Y. HIGA	2153	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,14-27 and 31-34* is/are pending in the application.

4a) Of the above claim(s) *11-13 and 28-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10,14-22,24-27,31 and 33* is/are rejected.

7)☒ Claim(s) *9,23,32 and 34* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of claims 1-10,14-27 and 31-34 in the reply filed on December 14, 2007 is acknowledged.

Claims 11-13 and 28-30 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Response to Arguments

Applicant's arguments with respect to claims 1-10,14-27 and 31-34 have been considered but are moot in view of the new ground(s) of rejection.

However, with respect to the applicant's argument that Sharma does not teach Next Avaialable Link (NAL) criterion the examiner respectfully disagrees.

The examiner is interpreting the applicant's Next Available Link schedule in view of the applicant's disclosure in ¶ 62 of the application's U.S. publication (US 2004/0267959).

> In contrast to the round robin selection method that uses a next link in a circular list of links, for example, links 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, . . . , the NAL technique enables a controller to determine which links are currently available for usage. Faster links return from service sooner than slower links so that the Next Available Link is typically one of the fastest links. Accordingly, the NAL technique can tremendously improve aggregate throughput. In contrast to the regular circular list of links using round robin selection, the NAL technique may produce a link ordering of, for example, 0, 1, 0, 1, 2, 1, 3, 0, 4, 1, . . . , where links 0 and 1 are fastest.

Therefore, as best understood, the NAL technique distributes data across multiple links based on available link usage.

Therefore, Sharma clearly teaches this type of link distribution. For example, in col. 2, lines 62-68, "A link distribution pattern is established based on a total speed of the links in a link bundle and a minimum possible link speed that is supported by the system. A link is selected *when it is capable of transmitting a fragment in a shortest time while decreasing out-of-sequence arrival*" (emphasis added). Thus, rather than selecting each link in a "round robin fashion" the distribution pattern as taught by Sharma selects the next available link based on whether or not the link is capable of transmitting a fragment in a shortest time while decreasing out-of-sequence arrival.

The distinction between a round robin type of distribution and that taught by Sharma is demonstrated by the resulting link distribution pattern in col. 6, line 45,
'A B A A B C', which is contrast to the 'A B C A B C' pattern that would have been expected by a round robin scheduling algorithm.

Claim Objections

Claim 33 is objected to because of the following informalities:

Claim 33 contains a typographical error, the claim reads "the controller that assigns the communication link plurality into at least one…"

For the sake of this office action the examiner has interpreted the claim to read "the controller that assigns the plurality of communication links into at least one…"

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 25-29 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claimed invention is directed to a article of manufacture comprising: "a tangible controller usable medium", however, page 21 of the applicant's specification provides evidence that the applicant intends for the controller usable medium to include propagation, communication, or transport mediums (i.e. electronic, magnetic, optical, electromagnetic, infrared signals) which are non-statutory under 35 U.S.C 101.

Amending the claim to reference a tangible controller usable medium does not overcome the rejection, since by definition the term "tangible" means "something that is capable of being precisely identified or realized by the mind". In order to overcome the 35 U.S.C 101 rejection the examiner recommends, the applicant amend claims 25-29, with reference to a "a computer readable storage medium" or "a controller usable storage medium", which is supported in the specification in ¶ 0087 of applicant's specification, and appropriately differentiates from the listed "propagation and transport" mediums.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 14 are rejected under 35 U.S.C. 102(e) as being unpatentable over Sharma et al. (US 7,184,402), hereafter "Sharma".

As per claim 1, Sharma teaches a method of interconnecting a network infrastructure via a plurality of communication links comprising:

Defining a link affinity grouping ('link bundles' col. 1, lines 55-62) based on a criteria including throughput (read as link speed or bandwidth) for round-robin scheduling (see col. 4, lines 12-15, wherein links with the same speed are grouped for round-robin distribution) and next available link (NAL) scheduling (and also if the links have different speeds they are grouped for NAL scheduling, see col. 4, lines 7-13, and col. 22-26, and see examiner's response to arguments above); classifying the plurality of communication links (see col. 1, lines 55-62) according to a link affinity grouping (see

col. 4, lines 12-15, wherein the links are grouped for round robin distribution if they have the same speed or NAL scheduling, see examiner's remarks above, if they have different speeds); enabling and disabling selective ones of the plurality of communication links according to a link affinity grouping (see col. 2, lines 61-65, "selecting (i.e. enabling) a link when it is capable of transmitting a fragment", which inherently deselects, read as disabling the link, when it is not capable of transmitting a fragment); and activating a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping (see either round-robin grouping, col. 4, lines 12-15 or NAL grouping, col. 4, lines 7-13, and col. 22-26, and see examiner's response to arguments above).

As per claim 14, Sharma teaches a storage system comprising an interface (see Fig. 1) capable of interconnecting a network infrastructure via a plurality of communication links, the plurality of communication links having a diversity of data-carrying capacity and performance (see col. 1, lines 55-62) and

A controller coupled to the interface that assigns the plurality of communication links into at least one affinity group, based on performance criteria including throughput (read as link speed or bandwidth) for round-robin scheduling (see col. 4, lines 12-15, wherein links with the same speed are grouped for round-robin distribution) and throughput for a next available link scheduling (and also if the links have different speeds they are grouped for NAL scheduling, see col. 4, lines 7-13, and col. 22-26, and see examiner's response to arguments above), and that controls link selection based on the link affinity

grouping (see controlling via round-robin grouping, col. 4, lines 12-15 or NAL grouping, col. 4, lines 7-13, and col. 22-26, and see examiner's response to arguments above).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-4, 8, 10, 15, 16, 18-21, 24-27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharma (US 7,184,402) in view of MacFarlane et al. (US 6516348), hereafter referred to as MacFarlane.

As per claims 2 and 15, Sharma does not expressly teach analyzing performance of the enabled communication links individually and in aggregate.

However, in the same art of network resource managing, MacFarlane teaches a method of monitoring bundled WAN links, wherein the links are monitored individually, but upon, display the system presented by MacFarlane combines the individual links to present a user with an aggregate display of the total available bandwidth across the bundled WAN links (see col. 6, lines 6, lines 10-29).

One of skill in the art would have been motivated to combine the teachings of Sharma with the teachings of MacFarlane in order to allow a user to monitor for possible link degradations during the operation of Sharma's invention.

As per claim 3, the combination of Sharma and MacFarlane further teaches determining whether the aggregate performance has declined to below a predetermined limit (see MacFarlane, col. 5, lines 35-50).

The same motivation that was utilized for combining Sharma and MacFarlane in claim 2 applies equally well to claim 3.

As per claims 4 and 20, the combination of Sharma and MacFarlane further teaches the step of generating an alert signal when the aggregate performance declines to below the predetermined limit (see MacFarlane, col. 2, lines 23-48).

The same motivation that was utilized for combining Sharma and MacFarlane in claim 2 applies equally well to claim 4.

As per claims 8, 21, 26 Sharma further teaches recommending, based on the analysis appropriate individual links for inclusion into a link affinity grouping based on criteria selected from among a group consisting of: potential throughput (see at least 'link speed', col. 4, lines 7-13).

As per claim 10, Sharma further teaches selecting a link for activation in a data replication operation comprising: maintaining a list of available links (see Fig. 1, ref. 105, 110, 115, 'A' 'B' 'C', read as a list of available links); including a link on the list when the link becomes available (see col. 2, lines 65-67, "a link is selected when it is capable of transmitting a fragment in a shortest time while decreasing out-of-sequence arrival", read as activating a link when it is capable (i.e. available) for transmitting); activating the next available link on the list (see col. 2, lines 65-67, selecting the capable link for transmitting); sending information over the activated next available link (see col. 2, lines 65-67 "transmitting"); receiving the sent information at a remote site (see Fig. 1, ref. 140); and reordering the received information into a proper order at the remote site (see col. 3, lines 30-33, "reassembly").

As per claim 16, the controller manages synchronous and unordered asynchronous disk array replication (see col. 3, lines 29-34, wherein the system can also reassemble out-of ordered (i.e. unordered) sequences) communicating data over all available links in a round-robin order (see col. 4, lines 13-15).
Sharma does not expressly teach determine whether the aggregate performance has declined to below a predetermined limit, and generates an alert message for performance declines below the limit.

As per claim 16, the controller manages synchronous and unordered asynchronous disk array replication (see col. 3, lines 29-34, wherein the system can also reassemble out-of

ordered (i.e. unordered) sequences) communicating data over all available links in a round-robin order (see col. 4, lines 13-15), determines whether the aggregate performance has declined to below a predetermined limit, and generates an alert message for performance declines below the limit.

However, in the same art of network resource managing, MacFarlane teaches a method of monitoring bundled WAN links, wherein the links are monitored individually, but upon, display the system presented by MacFarlane combines the individual links to present a user with an aggregate display of the total available bandwidth across the bundled WAN links (see col. 6, lines 6, lines 10-29). Furthermore MacFarlane teaches determining whether the aggregate performance has declined to below a predetermined limit (see MacFarlane, col. 5, lines 35-50) and also the step of generating an alert signal when the aggregate performance declines to below the predetermined limit (see MacFarlane, col. 2, lines 23-48).

The same motivation that was utilized for combining Sharma and MacFarlane in claim 2 applies equally well to claim 16.

As per claim 18, Sharma further teaches the controller manages ordered assyncrhonous disk array replication by enabling and disabling selective ones of the plurality of communication links according to the link affinity grouping (see Fig. 1, wherein link 105, 110, and 115, are 'enabled' for bundling where as link 150 is not), and activating a particular link selected from among the enabled communication links using

a selection process adapted to characteristics of the link affinity grouping (see col. 2, lines 61-65, “selecting (i.e. enabling) a link when it is capable of transmitting a fragment”, which inherently deselects, read as disabling the link, when it is not capable of transmitting a fragment).

As per claim 19, Sharma further teaches the controller selects a link for activation in a data replication operation by: maintaining a list of available links (see Fig. 1, ref. 105, 110, 115, ‘A’ ‘B’ ‘C’, read as a list of available links); including a link on the list when the link becomes available (see col. 2, lines 65-67, “a link is selected when it is capable of transmitting a fragment in a shortest time while decreasing out-of-sequence arrival”, read as activating a link when it is capable (i.e. available) for transmitting); activating the next available link on the list (see col. 2, lines 65-67, selecting the capable link for transmitting); sending information over the activated next available link (see col. 2, lines 65-67 “transmitting"); receiving the sent information at a remote site (see Fig. 1, ref. 140); and reordering the received information into a proper order at the remote site (see col. 3, lines 30-33, “reassembly”).

As per claim 24, the controller manages disk array replication using a protocol converter by communicating data over all available links in a round robin order over identical throughput links (see col. 4, lines 12-15, wherein links with the same speed are grouped for round-robin distribution).

As per claim 25, Sharma teaches a code causing the controller to define a link affinity grouping (‘link bundles' col. 1, lines 55-62) based on a plurality of criteria including throughput (read as link speed or bandwidth) for round-robin (see col. 4, lines 12-15, wherein links with the same speed are grouped for round-robin distribution) and next available link (NAL) scheduling (and also if the links have different speeds they are grouped for NAL scheduling, see col. 4, lines 7-13, and col. 22-26, and see examiner’s response to arguments above); a code causing the controller to classify the plurality of communication links (see col. 1, lines 55-62) according to a link affinity grouping (see col. 4, lines 12-15, wherein the links are grouped for round robin distribution if they have the same speed or NAL scheduling, see examiner's remarks above, if they have different speeds); a code causing the controller to enable and disable selective ones of the plurality of communication links according to the link affinity grouping (see Fig. 1, wherein link 105, 110, and 115, are 'enabled' for bundling where as link 150 is not); a code causing the controller to activate a particular link selected from the enabled communication links (see col. 2, lines 61-65, “selecting (i.e. activating) a link when it is capable of transmitting a fragment”, which inherently deselects, read as disabling the link, when it is not capable of transmitting a fragment) using a selection process adapted to characteristics of the link affinity grouping (see either round-robin grouping, col. 4, lines 12-15 or NAL grouping, col. 4, lines 7-13, and col. 22-26, and see examiner’s response to arguments above);

Sharma does not expressly teach a code causing the controller to analyze performance of the enabled communication links individually and in aggregate.

However, in the same art of network resource managing, MacFarlane teaches a method of monitoring bundled WAN links, wherein the links are monitored individually, but upon, display the system presented by MacFarlane combines the individual links to present a user with an aggregate display of the total available bandwidth across the bundled WAN links (see col. 6, lines 6, lines 10-29).

The same motivation that was utilized for combining Sharma and MacFarlane in claim 2 applies equally well to claim 25.

Claim 27 is rejected under the same rationale as claim 10, since they recite substantially identical subject matter. Any differences between the claims do not result in patentably distinct claims and all of the limitations are taught by the above cited art.

Claims 5-7, 17, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable Sharma (US 7,184,402) in view of MacFarlane (US 6516348), in further view of Lancon et al. (US 6647028), hereafter referred to as Lancon.

As per claims 5, 17, and 22, the combination of Sharma and MacFarlane does not expressly teach identifying an individual link wherein, based on the analysis, disabling of the identified link from the aggregate in the link affinity grouping will improve aggregate throughput.

However, in the same art of network resource management, Lancon teaches a method of monitoring aggregated physical links, including the step of identifying an individual link wherein, based on an analysis, disabling of the identified link from the aggregate will improve aggregate throughput (see col. 2, lines 33-61 and col. 3, lines 45-64, wherein based on the detection of a failure of one or more of the links the available aggregate bandwidth is readjusted to the remaining, links, read as disabling the identified link from the aggregate).

One of skill in the art would have been motivated to combine the teachings of Sharma and MacFarlane with the teachings of Lancon in order to improve bandwidth utilization of a link grouping.

As per claim 6, the combination of Sharma, MacFarlane, and Lancon further teaches automatically disabling the identified link (see Lancon col. 3, lines 55-64).

The same motivation that was utilized for combining Sharma, MacFarlane and Lancon in claim 5 applies equally well to claim 6.

As per claim 7, the combination of Sharma, MacFarlane, and Lancon further teaches recommending disabling of the identified link (read as a signal for triggering the automatic adjustment of bandwidth, see Lancon col. 3, line 64 - col. 4, line 2).

The same motivation that was utilized for combining Sharma, MacFarlane and Lancon in claim 5 applies equally well to claim 7.

Claims 31 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable Sharma (US 7,184,402) in view of MacFarlane (US 6516348), in view of Gray et al. (US 6,178,448), hereafter "Gray", in further view of McCullough et al. (US 2002/0010866), hereafter "McCullough".

As per claims 31 and 33, Sharma does not teach defining the link affinity grouping based on a plurality of criteria further including characteristics of link path security, link cost, and conditions of link availability.

However, in the same art of link bundling, Gray teaches a system for bundling a plurality of concurrent parallel links between a first node and a second node in a communication network based upon link quality information including a bit error rate for the link or the number of retransmitted packets for the link (read as link cost (the examiner is reading link cost as in the cost in time for transmitting a packet across the link) and conditions of link availability (i.e. the quality of the link), see col. 9, lines 47-col. 10, line 31).

One of skill in the art would have been motivated to combine the teachings of Sharma with the teachings of Grey for grouping the plurality of links based on quality information, in order to avoid the degradation of one link in a group of concurrent links, thus resulting in a reduction in efficiency of the other links in the group (see Gray col. 10, lines 25-31).

Furthermore, in the same art of link bundling, McCullough teaches a system for bundling a plurality of secure links (read as link path security, see ¶ [0007]-[0009]). One of skill in the art would have been motivated to combine the teachings of Sharma and McCullough, for bundling links based on a security characteristic, in order to reduce the vulnerability of information transmitted across such links, from possible intrusion.

Allowable Subject Matter

Claim 9, 23, 32 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brendan Y. Higa whose telephone number is (571)272-5823. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenton Burgess can be reached on (571)272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BYH
/Glenton Burgess/

Supervisory Patent Examiner, Art Unit 2153